LANGAN
ENGINEERING & ENVIRONMENTAL SERVICES

13 January 2012

Elizabeth Palmer
Fisher Brothers Management
299 Park Avenue, Suite 42
New York, NY 10171

Re: Historic and Cultural Resource Due Diligence
111 Washington Street Project
New York, New York
Langan Project No. 001948405

Dear Ms. Palmer:

This report provides preliminary due diligence regarding historic and cultural resources in the vicinity of the 111 Washington Street Project (Project) in Lower Manhattan. The report identifies resources within a 400-foot study area of the project site. The report also summarizes the regulations, regulatory agencies, and anticipated environmental review processes applicable to the project.

Information for this report was assembled utilizing the following sources:

- City Environmental Quality Review (CEQR) Technical Manual
- NYC Department of City Planning - NYCityMap GIS
- NYC Landmarks Preservation Commission (LPC)
- New York State Office of Parks, Recreation & Historic Preservation (NYSOPRHP) - State Historic Preservation Office (SHPO)

PROJECT SITE

The proposed project involves the construction of a 46-story, approximately 383,000-gsf residential building at 111 Washington Street in Lower Manhattan (Manhattan Block 53, Lot 12). The 11,255-square foot project site is bound by Carlisle Street to the north; properties along the west side of Greenwich Street to the east, the property at 109 Washington Street to the south and Washington Street to the west (see Figure 1). As shown in Site Photograph No. 1 (Appendix A), the site is currently undeveloped and contains construction equipment and storage containers.

GENERAL INFORMATION

Historic and cultural resources include both architectural and archaeological resources. Architectural resources generally include historically important buildings, structures, objects, sites and districts. Archaeological resources include physical remains, usually subsurface, of the prehistoric, Native American, and historic periods–-such as burials, foundations, artifacts etc.

Historic resources include National Historic Landmarks, properties listed on or determined to be eligible for listing on the State and National Registers of Historic Places (S/NR), New York City Landmarks (NYCL) or Historic Districts (NYCHD), and properties pending NYCL or NYCHD designation.

HISTORIC AND CULTURAL RESOURCES IN PROJECT AREA

Table 1-1: Historic Resources in the Project Area

Resource	Address	Block/Lot	Status
Lamppost No. 80	Adjacent to 107 & 109 Washington Street between Rector and Carlisle Streets	Block 53, Lots 4 & 6	NYCL
(Former) St. George's Syrian Catholic Church	103 Washington Street	Block 53, Lot 3	NYCL
Lamppost No. 79	Northeast corner of Albany & West Streets adjacent to 21-25 Albany St. (a/k/a 90 West Street)	Block 56, Lot 4	NYCL
94 Greenwich Street House	94 Greenwich St	Block 53, Lot 41	NYCL
West Street Building	90 West Street	Block 56, Lot 4	NYCL & NR
New York Evening Post Building	75 West Street	Block 55, Lot 14	NR
Greenwich Club Residences	19 Rector Street	Block 18, Lot 7501	NR
American Stock Exchange	86 Trinity Place	Block 51, Lot 13	NR
NYCL = New York City Landmark, NR – National Register of Historic Place Sources: New York City Landmarks Preservation Commission, State Historic Preservation Office, NYCity Map.			

Historic Resources

Table 1-1 lists eight historic properties and structures within a 400-foot radius of the project site. Pursuant to City Environmental Quality Review (CEQR) guidelines, this is generally the area which is most likely to be affected by the proposed development. Four NYCL properties are located within close proximity to the project site, and four properties are on the National

Register of Historic Places (NRHP). One property, 90 West Street, located approximately 330 feet northwest of the project site, is both a NYCL and NRHP.
Based on NYC Department of Buildings (DOB) guidelines for protecting historic structures during construction (see Attachment B - Technical Policy and Procedure Notice (PPN) #10/88), two LPC-designated or S/NR-listed resources are located within 90 feet of the project site:

- Historic lamppost No. 80 - Approximately 30 feet from the project site.
- Former St. George's Syrian Catholic Church - Approximately 90 feet from the project site.

Archaeological Resources

According to NYSOPRHP's on-line environmental resource mapping program, the project site is within an archaeologically sensitive area. Archaeological resources usually must be assessed for projects that would result in any in-ground disturbance. According to CEQR, in-ground disturbance is any disturbance to any area not previously excavated, including new excavation that is deeper and/or wider than previous excavation on the same site.

REGULATIONS AND STANDARDS

This section summarizes the various Federal, State and Local laws that apply to historic resources.

Federal Regulations

National Historic Preservation Act of 1966 (NHPA) – If the project is federally funded (i.e., U.S. Housing and Urban Development) then the requirements of the NHPA apply. Section 106 of the NHPA requires federal agencies to address the environmental impacts their funding activities have on significant historic properties. In this example, the federal agency responsible for funding will coordinate with the SHPO on measures necessary to avoid impacts on historic properties. This process usually results in a Memorandum of Agreement between the agency and consulting parties that outlines the agree-upon measures for protection.

State Regulations

New York State Historic Preservation Act of 1980 (SHPA) – If a project is funded by a state agency Article 14 of the SHPA requires the agency must avoid or mitigate any significant adverse impacts on historic properties to the fullest extent practicable. As is the case with the State Environmental Quality Review Act (SEQRA), SHPA mandates that the state agency consult with SHPO on measures for protecting historic properties.

New York City Regulations

The New York City Landmarks Law – In addition to giving the LPC the authority to designated City Landmarks and Districts etc., under the NYC Landmarks Law no new construction, alteration, reconstruction or demolition can take place on Landmarks, Landmark sites or within designated historic districts until the LPC has issued a "Certificate of No Effect". Projects reviewed under CEQR that physically affect a Landmark or properties within a historic district require mandatory review by LPC.

REGULATORY AGENCIES

This section describes the regulatory agencies responsible for the review of historic and cultural resources.

State Historic Preservation Office (SHPO)

The NYSOPRHP also serves as the SHPO, which is responsible for conducting review of New York's historic resources to address potential adverse impacts of projects that are funded, licensed or approved by state or federal agencies. Under Section 106 of the NHPA and Section 14.09 of the SHPA, SHPO's role in the review process is to ensure that impacts on eligible or listed properties are considered and avoided or mitigated during the project planning process. In addition, the SHPO advises local communities on local preservation environmental reviews, upon request, under the provisions of SEQRA.

NYC Landmarks Preservation Commission

The LPC is the New York City agency that is responsible for identifying and designating the City's landmarks and the buildings in the City's historic districts, and regulating changes to designated buildings. LPC is also involved in the SEQR/CEQR process by providing information, technical review, and recommendations for mitigation potential impacts to historic and cultural resources. As the only City agency that has archaeologists on staff, LPC also reviews projects for potential impacts on archaeological resources.

ENVIRONMENTAL REVIEW

6 NYCRR Part 617 (SEQR) and its NYC application, CEQR are environmental review processes by which the impacts of a particular action are identified and evaluated to determine the degree of significance.

As a general rule, SEQR/CEQR applies whenever a particular action:

- is directly undertaken by an agency;
- involves funding by an agency; or
- requires one or more new or modified discretionary approvals from an agency or agencies.

If after a preliminary environmental assessment an action is deemed to result in significant adverse environmental impacts (i.e., traffic, shadows on sun-sensitive open space resources, significant displacement of residences or businesses), a "positive declaration" is issued by the project lead agency and the action is then subject to an Environmental Impact Statement (EIS). An EIS is a comprehensive disclosure document that evaluates a project's impacts on array of environmental factors, identifies alternatives to the project and, if necessary, mitigation measures to limit potential adverse environmental impacts. Under CEQR, the EIS process involves public scoping and regulatory agency review. As a rule of thumb, depending on the size and scope of a project and on-site conditions (i.e., level of contamination), the EIS process can take 12-18 months to complete.

If after the preliminary environmental assessment a project is found not to result in significant adverse environmental impacts, a "negative declaration" is issued by the lead agency and the environmental review process would be complete. In the event that an EIS is not required, completion of this process can take up to 6 months, depending on the level of review necessary.

Environmental Review Applicability to the Proposed Project

Funding

Projects that involve funding or a discretionary approval from a state agency are typically subject to SEQR. Projects that are funded or require discretionary approval from a city agency are reviewed under CEQR. Under both environmental review processes, when funding is involved, coordination with SHPO and LPC is required.

Zoning Changes, Variances or Special Permits

If the project seeks a zoning change or zoning variance from the City, (i.e., for bulk or height waivers), or a special use permit (i.e., to add parking beyond zoning requirements, or change a use not permitted as-of-right), a discretionary approval would be necessary from the Board of Standards and Appeals or the City Planning Commission, and would trigger review under CEQR.

In the event that the project will be constructed as-of-right, and no local or state funding or discretionary approvals would be needed, the project would not be subject to review under SEQR/CEQR. However, in this scenario, the NYC Department of Buildings (DOB) may require a construction protection plan in accordance with DOB guidelines for the protection of adjacent historic properties. These guidelines are discussed in further detail in the "Protecting Historic Properties" Section.

Regulatory Agency Coordination

If the project is subject to SEQR/CEQR LPC and SHPO should be contacted as early as possible in the planning of a project to identify historic resources in a particular project area. The agencies will typically coordinate as part of the review process. Submissions to SHPO should include a Project Review Form which identifies the project location, involved regulatory agencies and funding sources. The submission should also include project plans, photographs and historic maps of the project site.

The agencies will usually review a project within 30 days. At the end of the review period, they will either request additional information (i.e., photographs of buildings to be demolished, environmental review documents, additional archaeological study etc.,) or issue a letter indicating the project will not result in any adverse effects to identified historic and cultural resources.

Protecting Historic Properties

SHPO and LPC also advise on methods for protecting nearby historic structures and often require an applicant to provide a demolition or construction protection plan that must be approved prior to any construction. Coordination with SHPO/LPC for projects located adjacent to historic structures typically follow the guidelines and procedures outlined in the NYC Department of Building's (DOB) Technical Policy and Procedure Notice (PPN) #10/88, to avoid damage to historic structures from adjacent construction. The PPN defines an adjacent historic structure as being a building which is a designated NYC Landmark or S/NR listed and that is contiguous to or within a lateral distance of 90 feet from a lot under development or alteration.

Developed by the DOB, the PPN must be followed for construction within proximity of historic landmarks to avoid potential adverse impacts during construction. Under the PPN, a construction protection plan (CPP) must be provided to SHPO/LPC for review and approval prior to construction. When required, a CPP would follow the guidelines set forth in LPC's Guidelines for Construction Adjacent to a Historic Landmark and Protection Programs for Landmark Buildings. *TPPN 10/88* supplements the standard building protections afforded by the Building Code C26-112.4 by requiring a monitoring program to reduce the likelihood of construction damage to adjacent LPC-designated or S/NR-listed resources (within 90 feet) and to detect at an early stage the beginnings of damage so that construction procedures can be changed.

SUMMARY

If the project is subject to SEQR/CEQR based on funding or the need for a discretionary permit or approval from a state or city agency, we anticipate coordination with LPC and SHPO will be required. Because the project occurs in NYC we anticipate LPC will lead the review process in coordination with SHPO. As such, we anticipate LPC will:

- Identify historic and cultural resources in the project area;
- Assess the potential project impacts on these resources;
- Identify known or potential cultural resources in the project area and if applicable, will recommend further archaeological investigation.
- Outline measures for protecting historic properties, typically in accordance with DOB's Technical Policy and Procedure Notice (PPN) #10/88 ;
- Issue a "No Effects" letter if all measures for protecting and preserving historic and cultural resources have been satisfactorily addressed.

If the proposed project is constructed "as-of-right", and no federal or state funding is involved, and no discretionary approvals are needed, we anticipate:

- Coordination with LPC will be necessary based on the two landmark resources within close proximity to the project site.
- LPC will likely require a construction protection plan in accordance with DOB's Technical Policy and Procedure Notice (PPN) #10/88 that demonstrates the measures that will be taken to protect the historic lamppost in front of 105 Washington and the former church at 103 Washington Street.
- Construction of the project will not be permitted until the construction protection plan is approved by LPC.

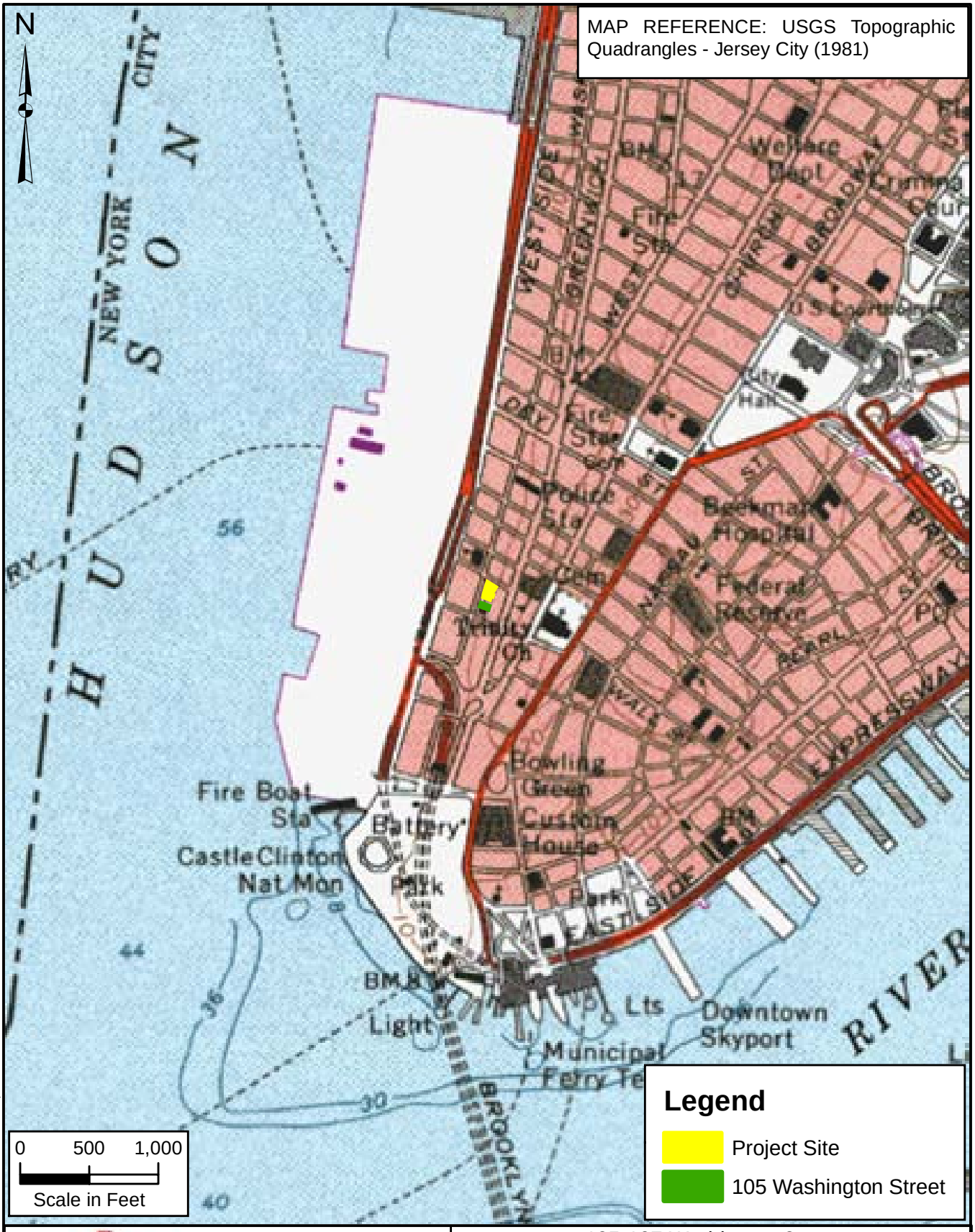
Sincerely,
Langan Engineering and Environmental Services, Inc., PC

Thomas E. Devaney, AICP, LEED AP
Senior Environmental Planner

TED:sac

Attachments: Figure 1 – Site Location Map
Figure 2 – Historic Resources Map
Appendix A – Site Photographs
Appendix B – NYC DOB Technical Policy and Procedure Notice (PPN) #10/88

FIGURES



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NJ Certificate of Authorization No: 24GA27996400

Project 105-107 Washington Street
111-121 Washington Street/4-10 Carlisle Street

USGS SITE LOCATION MAP

MANHATTAN
NEW YORK COUNTY NEW YORK

Project No.	Date	Scale	Figure
1948405	1/10/2011	1" = 1000'	1

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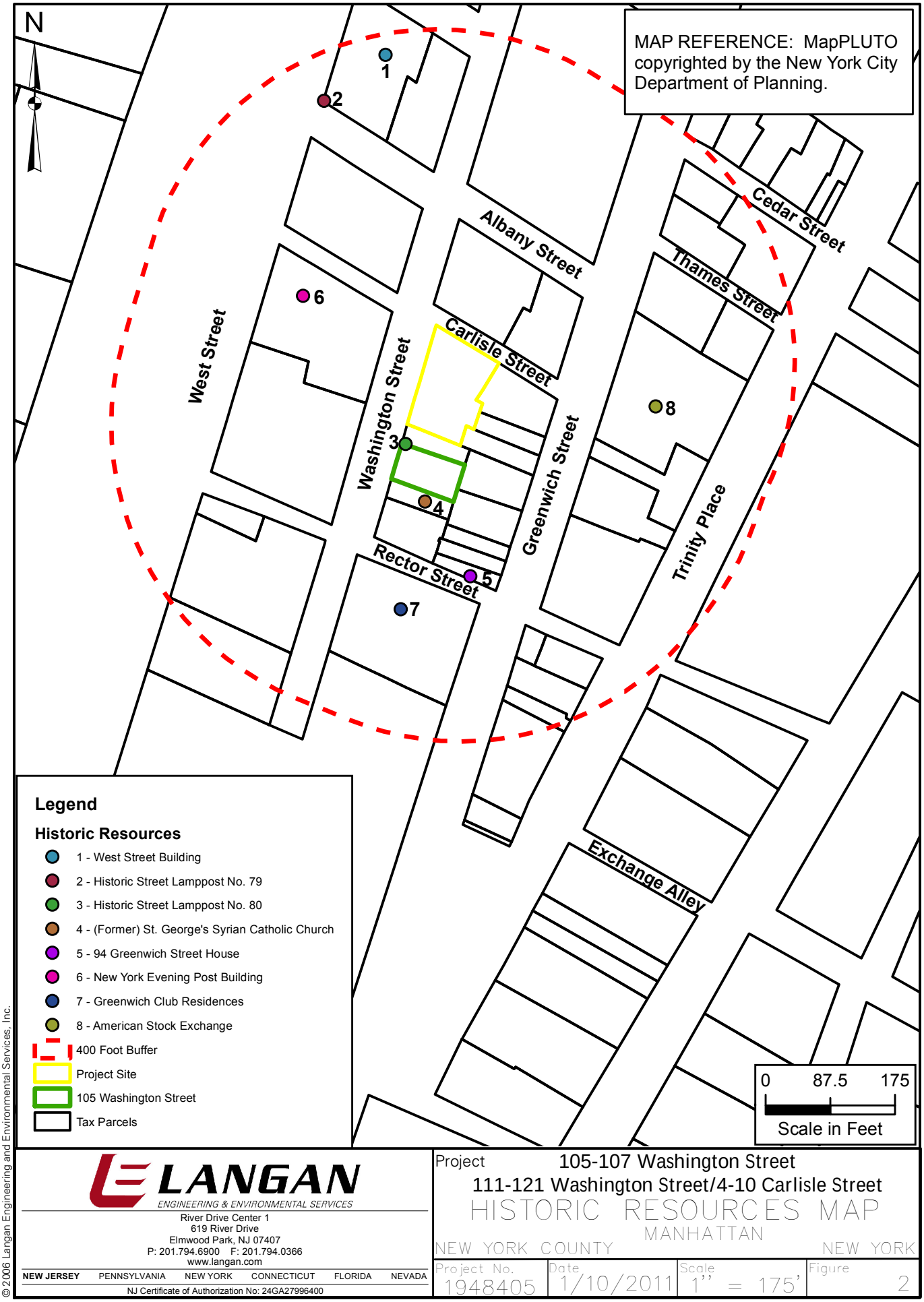

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Project 105-107 Washington Street
111-121 Washington Street/4-10 Carlisle Street

HISTORIC RESOURCES MAP

MANHATTAN
NEW YORK COUNTY NEW YORK

Project No.	Date	Scale	Figure
1948405	1/10/2011	1" = 175'	2

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APPENDIX A

SITE PHOTOGRAPHS

Photograph No.1- Southeast view of project site from Washington St. and Carlisle St.

Photograph No. 2 – South view of Washington Street from Project Site.

Photograph No. 3 –109 and 105 Washington Street with historic lamppost No. 80.

Photograph No. 4 – Historic lamppost No. 80.

Photograph No. 5 – Property at 105 Washington Street.

Photograph No. 6 – 103 Washington Street, Former St. George's Syrian Catholic Church.

Photograph No. 7 – 94 Greenwich Street House

APPENDIX B

NYC DOB TECHNICAL POLICY AND PROCEDURE NOTICE (PPN) #10/88

Attachment A

NEW YORK CITY LANDMARKS PRESERVATION COMMISSION GUIDELINES FOR CONSTRUCTION ADJACENT TO A HISTORIC LANDMARK

A. Preconstruction Conditions:

The applicant, its agent, employees, successors, or assigns must develop, carry out and maintain construction procedures to protect the foundations and the building structures of individually designated landmark sites or structures within historic districts. The applicant, its agency, employees, successors, or assigns would compile information initially and as construction proceeds including but not limited to the following:

- An evaluation of the water level, extent, flow, fluctuations and variations on the site and adjacent properties;
- Borings and soils reports of the water table establishing composition stability, condition;
- Sheetpiling or cofferdam design;
- Dewatering procedures including systematic monitoring and recharging systems;
- Existing foundation and structural condition information and documentation for the historic property or properties and the related sites;
- Formulation of maximum vibration tolerances based on impact and duration and considerations using accepted engineering standards for old buildings. Monitoring shall utilize tell-tales, seismographic equipment and horizontal and lateral movement scales in addition to other required techniques to establish vibration effects of pile driving or other construction methods on the historic building structures.

This information must be submitted by an independent monitoring consultant, who must be a foundation and structural engineer selected by the applicant whose credentials must be approved by the Landmarks Preservation Commission or other appropriate city agency. The information will be evaluated by the Landmarks Preservation Commission and/or other appropriate sources with respect to the techniques to be used to protect the historic building structures and sites and to avoid significant variations in the water table under such building(s) and to mitigate the effects of pile driving and other construction techniques. The consultant's report and any comments prepared shall be submitted to the appropriate city

agencies as determined by the Landmarks Preservation Commission.

B. Construction Requirements

- Construction shall proceed according to final plans as approved by the Department of Buildings.

- The monitoring consultant referred to above shall be retained by the applicant at its sole cost and expense, to monitor the construction of the project on a regular basis to insure that the existing conditions of the historic building and site remain unaffected. Said consultant shall prepare reports on the monitoring and submit the same to the Landmarks Preservation Commission for distribution as appropriate.

- Should the Landmarks Preservation Commission and/or the structural engineer identify the beginnings of any damage to the historic building foundations and/or building structures during construction, immediate steps will be taken by the engineer to have the construction company halt work, revise operations to prevent further damage to the historic structures, and to repair the damage. Work will not recommence before Landmarks Preservation Commission approval of the proposed revisions and repair work on the landmark will be done only in accordance with permits issued by the Commission under the Landmark Law.

- The applicant must have adequate insurance to the extent available at reasonable rate to cover said expenses of restoration and /or replacement of any historic structures damaged by construction operations, or alternative provisions must be made to provide a sufficient fund to cover said expenses of restoration and/or replacement. Such insurance or alternate provisions must be approved by the Landmarks Commission.

The City of New York

DEPARTMENT OF BUILDINGS

EXECUTIVE OFFICES
60 HUDSON STREET, NEW YORK, NY 10013

CHARLES M. SMITH, Jr., R.A., Commissioner
312-8100

Issuance #109

TECHNICAL
POLICY AND PROCEDURE NOTICE # 10/88

TO: Borough Superintendents

FROM: Irving Polsky, P.E., Executive Engineer

DATE: June 6, 1988

SUBJECT: Procedures for the Avoidance of Damage to Historic Structures Resulting from Adjacent Construction When Subject to Controlled Inspection by Section 27-724 and for Any Existing Structure Designated by the Commissioner.

BACKGROUND: Approval of the Landmarks Preservation Commission is required before any changes may be made to protected features of any individually designated landmark or properties within historic districts. A listing of these was furnished to each Borough. Building Code Section 27-166 (C26-112.4) serves to protect historic structures by requiring that all lots, buildings and service facilities adjacent to foundation and earthwork areas shall be protected and supported in accordance with the requirements of Building Construction Subchapter 7 (Article) and Building Code Subchapters 11 and 19 (Article). The intent of these procedures is to supplement the latter and require a monitoring program to reduce the likelihood of construction damages to adjacent historic structures and to detect at an early stage the beginnings of damage so that construction procedures can be changed.

It is also intended that these procedures shall be used to safeguard any existing structure in accordance with Section 27-127 (C26-105.1) if deemed necessary by the Commissioner.

DEFINITION: ADJACENT HISTORIC STRUCTURE. A structure which is a designated New York City Landmark or located within an historic district, or listed on the National Register of Historic Places and is contiguous to or within a lateral distance of ninety feet from a lot under development or alteration.

SUPPLEMENTARY PROCEDURES: The architect or engineer designated for Controlled Inspection of Construction Required for or Affecting the Support of Adjacent Properties or Buildings required by Section 27-724 (C26-1112.6) shall institute a monitoring program for adjacent historic structures and for any existing structure designated by the Commissioner. The following supplementary procedures shall be considered and adhered to:

1.0. Subsurface conditions and effects that might influence performance of structures.

Subsurface Conditions		Effect that Might Influence Performance of Structures
1.1.	Large obstructions in the fill	Vibrations during excavating and pile driving operations
1.2.	Shallow water table	Drawdown of water table and loss of ground during excavation operations
1.3.	Previous layers within and under the hardpan stratum	Loss of ground during excavation operations
1.4.	Dense nature of hardpan	Vibrations during excavating and pile driving operations
1.5.	Boulders	Vibrations during pile driving and/or blasting operations
1.6.	Bedrock	Vibrations during pile driving and/or blasting operations

2.0. Construction vehicular traffic and construction equipment movement which might increase existent vibration levels.

3.0. Establishment of a peak particle velocity design criteria during the driving of sheeting or blasting operations.

3.1. The maximum permissible peak particle velocity shall be 0.5 in./sec. (13mm/sec.) with no distance criterion.

3.2. The maximum permissible peak velocity shall be reduced if movements or cracking is detected.

3.3. Maintaining accurate records, including the location of the blast, total explosive weight in the blast, maximum explosive weight per delay (or the explosive weight in each blast hole and the designation of the delay cap used in each hole).

4.0. Establishment of criteria for any temporary retaining wall structure.

4.1. The maximum permissible horizontal and vertical movement of the temporary retaining wall system shall be designed in accordance with generally accepted engineering practice.

5.0. Establishment of movement criteria for the historic building.

5.1. The maximum permissible vertical and horizontal movement shall be ½in. (6mm.).

6.0. Establishment of criteria for ground water.

6.1. The lowest water level shall be determined by periodic ground water monitoring at observation wells, seasonably adjusted and designated as the "low datum" prior to the start of excavation operations.

6.2. Limitation on water drawdown shall be considered in the criteria for the retaining system.

7.0. Establishment of a monitoring program.

8.1. A licensed surveyor shall be retained to monitor movements and tilting of the historic buildings and the temporary retaining system.

8.1.1. Settlements of the street and of selected points on the ground are to be monitored.

8.1.2. Survey measurements shall be made a minimum of two times per week.

8.1.3. Optical survey readings shall be taken to an accuracy of ±0.01 ft. (3mm.).

8.2. "Telltales" shall be installed across existing cracks and in other sensitive areas to permit changes in crack width to be measured.

8.2.1. A micrometer sensitive to 0.001 in. (0.003mm.) shall be used to monitor crack widths at least once a day.

8.3. Water levels in observation wells are to be monitored at least twice a day for the period that active dewatering is in progress.

8.4. Requirements for seismographic test data. -

8.4.1. Obtain seismographic test data showing the vibration transmission characteristics of the area around the blasting site.

8.4.2. Vibrations from the driving of sheet piles, from excavating and blasting, shall be monitored with a portable seismograph placed adjacent to or within the historic structure closest to the vibration source.

8.5. Requirements for photographs. -

8.5.1. Photographs of the affected historic buildings of sufficient clarity to view the "telltales" shall be taken weekly during construction.

8.5.2. The photographs shall be identified on the back with the building address, direction, date, time and photographer.

9.0. Controlled Inspection Report. -

9.1. Records of the monitoring program shall be retained.

9.2. Controlled inspection reports as to the monitoring program shall be submitted to the department per amendment on B Form 10E within thirty days of completion of the excavation.

9.2.1. The report shall include a set of photographs taken pursuant to Item 8.8.

REFERENCES: "The Avoidance of Damage to Historic Structures Resulting from Adjacent Construction", Melvin I. Esrig and Andrew J. Ciancia, American Society of Civil Engineers, Preprint 81-052; "Effects of Blasting Vibrations on Buildings and People", John F. Wiss, P.E., Civil Engineering-ASCE - July 1968.

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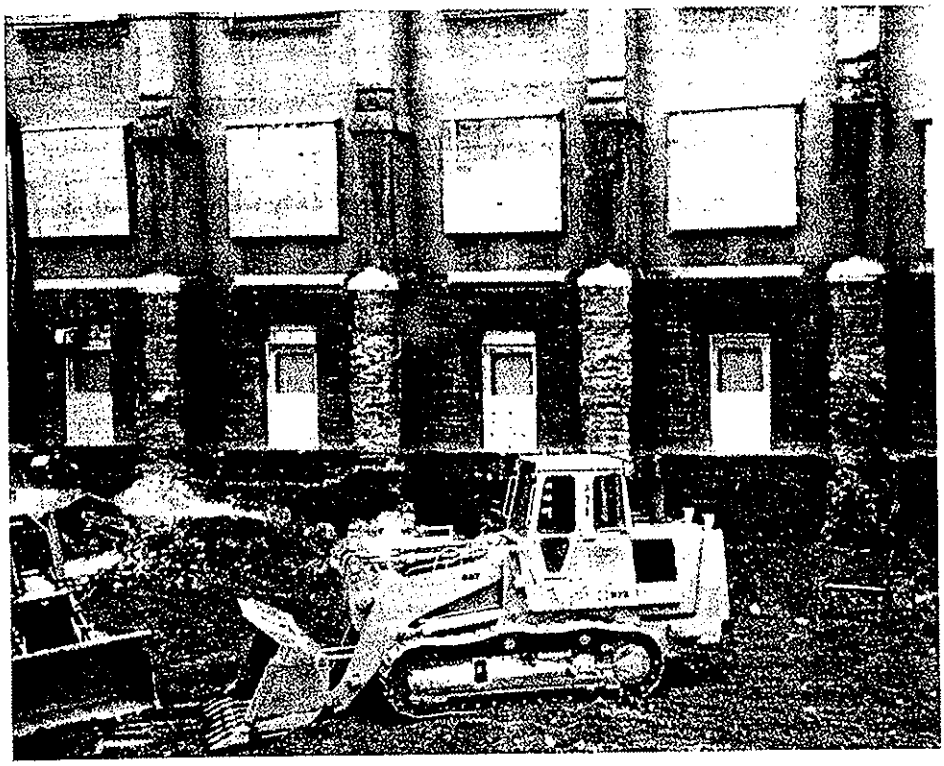

PRESERVATION
Tech Notes

U.S. Department of the Interior
National Park Service
Cultural Resources
Heritage Preservation Services

TEMPORARY PROTECTION

NUMBER 3

Protecting a Historic Structure during Adjacent Construction

Chad Randl
Technical Preservation Services
National Park Service

IDENTIFYING AND AVOIDING RISKS FROM ADJACENT CONSTRUCTION

Valued for their ability to convey the past through existing materials and features, historic buildings must also survive in an ever-changing present. That change is often characterized by new building construction and demolition activities on neighboring sites. Whether it is the modest renovation of an existing building or the demolition of an existing structure and construction of a new high rise, physical damage to an adjacent historic building may occur. It is important for both the historic property owner and those responsible for the neighboring work to give careful consideration to the potential risks. Early planning offers the opportunity to identify these risks and to determine successful ways to avoid them.

Problem

The forces that contribute to the deterioration of a historic building, from atmospheric pollutants to the footsteps of visitors, often take decades and even centuries to exact their toll. Demolition activities and new construction on neighboring sites, however, can cause immediate harm to the physical integrity of a historic structure. In the instant it takes an improperly planned excavation blast to crack the foundation of an adjacent historic structure, or for a steel beam to be dropped from a construction crane onto its roof, significant damage may occur. Additionally, adjacent construction work can expose the neighboring historic building to concentrations of dust, vibration and fire hazards that would normally be experienced only over the course of many years.

These concerns are often overlooked when a project is undertaken next to historic resources. In some situations, the historic property manager may be unaware of the nature and extent of work at an neighboring site. In other cases, the new construction team is not familiar with the particularly fragile character of the neighboring historic structure or decides to repair any damage after the fact rather than avoiding it from the beginning.

Solution

Effective planning and protective measures initiated before construction takes place can prevent most of the damage that may occur to adjacent historic buildings. Depending upon the nature of the project, protective measures may be limited to documenting and monitoring the historic structure or may encompass a broader plan that includes encasing windows, indepen-

When historic structures are exposed to adjacent construction or demolition work, a protective plan including documentation, monitoring and specific safeguards should be implemented to prevent damage and loss of historic fabric.

dent review of excavation procedures and a range of other precautions. Cooperation between all parties can help to ensure that construction activity continues without interruption and that the neighboring historic building is preserved unharmed.

The information provided in this *Tech Note* can serve as a basis for discussions between the historic property manager and the developer of the adjacent site aimed at ensuring the protection of the historic building in a cost-effective manner. This guidance is also applicable where new construction is undertaken on the same site as the historic structure.

Although adjacent construction work often poses a more immediate threat than the incremental impacts of weather or pollution, the best defense for both situations is that buildings be in good condition. A well maintained structure with tight mortar joints, strong connections between interior and exterior walls, solid foundations and sound plaster is at less risk from neighboring activity than a neglected structure.

Providing adequate protection involves the following steps: 1. consultation between the historic building owner and development team to identify potential risks, negotiate changes and agree upon protective measures; 2. documentation of the condition of the historic building prior to adjacent work; 3. implementation of protective measures at both the construction site and the historic site; and 4. regular monitoring during construction to identify damage, to evaluate the efficacy of protective measures already in place, and to identify and implement additional corrective steps.

Consultation

Early consultation between the historic property owner and the developer of the neighboring construction site is the first and often most important step. Establishing such contact has many advantages. Consultation provides the foundation for a mutually beneficial relationship that is cooperative rather than adversarial. The process gives the historic site owner an opportunity to become familiar with the scope of the impending project and for the development team to understand the historic structure's vulnerabilities. Consultation permits all parties a chance to propose, discuss, and negotiate changes to the construction plan that reduce the risk of damaging adjacent historic resources. The ultimate goal is to draft a protection plan acceptable to both parties.

Resolving concerns before construction is underway can save time and money, as well as the need to repair damaged historic fabric. It is crucial that such discussions take place during the paper stage of the project, before final decisions are made. If not, the developer may conclude that changes would be cost prohibitive and that it is preferable to repair damage after it takes place. Early consultation also provides information that can be used to assess whether the level of insurance coverage is sufficient to meet the specific project risks.

The owner of a historic property cannot in most cases compel the support and cooperation of the development team. If, after consultation has been attempted, the level of protection provided is not sufficient, the aid of local building officials should be sought. Local building officials, through the permitting process, can often insist that changes be made to development plans to ensure that adjacent properties are protected. Local building codes may also provide safeguards by establishing certain conditions such as maximum vibration levels.

Other parties can also participate in and contribute to the consultation process. The support of neighborhood committees, local non-profit preservation organizations, independent engineers and the historic district commission (if applicable) may be enlisted to ensure that protection concerns are fully addressed. The developer will benefit from the assembly of a team, including or representing the general contractor, architect, structural engineer, construction manager, and subcontractors, who can be present at consultation meetings and play a continuing role in balancing protection efforts with development interests.

Preconstruction meetings should address several issues. Most important, the parties should reach an understanding about what steps will be taken to protect the historic structure (*see figure 1*). Responsibility for implementing the agreed upon protections should be established among the developer, the general contractor and relevant subcontractors, and the historic property owner. Such decisions should be listed in performance specifications that accompany agreements between the contractor and the developer. A walk-through of the historic building by the development team is also advisable. Finally, schedules for major work such as excavation, and requirements for materials delivery, site storage, and other use of the premises by the con-

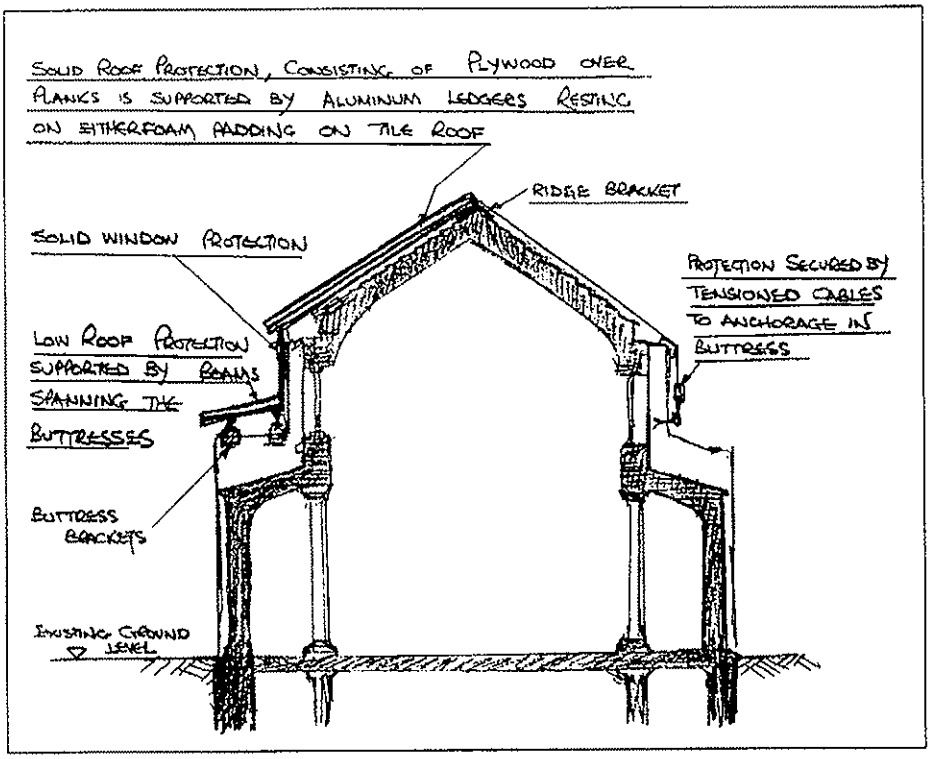

Figure 1. Before new construction was undertaken to the left of this church, a subcontractor was hired to design a protective system for the tile roof and clerestory windows. Drawing: Alan Shalders, Universal Builders Supply, Inc.

tractor should be discussed and arranged to minimize disruptions to the historic site.

Documentation

A crucial step following consultation with the developer is to document the existing condition of the historic structure. Such an investigation provides a "baseline" from which changes to the building during the adjacent construction can be identified, monitored and assessed. Like the consultation process, thorough documentation benefits both the historic property owner and the developer. For the former, it may be used to substantiate claims that damage occurred as a result of the neighboring construction work by illustrating the previously sound condition of the historic building. If the damage existed prior to construction work, the record can show that it was not caused by the developer's negligence. In the case of future litigation, the documentation record can serve as evidence along with the testimony of the professional who undertook the assessment.

Both parties should ensure that the documentation is objective and accurate. Joint surveys, in which both the developer and the historic property owner participate or sign off on noted conditions, are most likely to ensure that the resulting data are not in dispute. When the developer pays for the assessment, it is advisable that an independent professional be hired and that the survey results be accessible.

Information obtained through documentation can also be used in formulating a protection plan for the historic building. By characterizing existing damage and exposing potential weaknesses, the documentation process identifies areas of the structure that may require additional protection as well as appropriate locations for monitoring equipment. Features that should receive particular attention during visual inspections would also be highlighted. Although a formal building condition survey including analysis, repair proposals and cost estimates is not necessary, the property owner may find that the disruptive period during adjacent work provides an opportune time for a thorough survey program.

Documentation of existing conditions should take the form of written descriptions, 35mm color photographs and/or a videotape recording. Photographs should show both the interior and exterior of the building, with close-up images of cracks, staining, indications of settlement or other fragile conditions. A complete interior and exterior crack survey should be undertaken to identify and characterize existing cracks *(see figure 2)*. Their locations can then be plotted on a drawing of each wall or ceiling surface. While identifying every hairline crack may be impractical in a large building or one that exhibits a great deal of preexisting damage, the more thorough the documented record, the better. The condition of features such as arches, chimney stacks and parapet walls determined by the engineer to be particularly susceptible to distress should also be recorded even when no damage is apparent.

Common Risks and Protective Measures

Each instance of new construction or demolition next to an existing historic structure will involve varying risks to that structure. The proximity of the historic site to the project and the scope of the project are two of the most significant variables. Construction of a high rise building with deep foundations is more likely to affect a neighboring structure than the rehabilitation of a nearby rowhouse. However, the converse may be true if the rowhouse is directly adjacent to and sharing a wall with the historic structure. Other factors influencing the degree of likely impact include the age, construction type and structural integrity of the historic building, as well as the depth and makeup of its foundation and its surrounding soil types.

Owners should also anticipate the effect increased dust, vibration and fire risk will have upon interior architectural features and furnishings. For the most sensitive objects, such as chandeliers, paintings and glassware, temporary removal to an off-site location may be the safest course. Those features that cannot be easily removed, including plaster ceiling medallions and cornices, can be cushioned and buttressed by padded wood supports. Additional information concerning the safeguarding of interior features can be found in the preceding *Tech Note* in this series, "Temporary Protection, Number 2. Specifying Temporary Protection of Historic Interiors During Construction and Repair."

The remainder of this section addresses some of the more common dangers to historic structures when new construction or demolition activities occur nearby. The description of each potential impact is accompanied by suggested approaches for reducing or eliminating those risks.

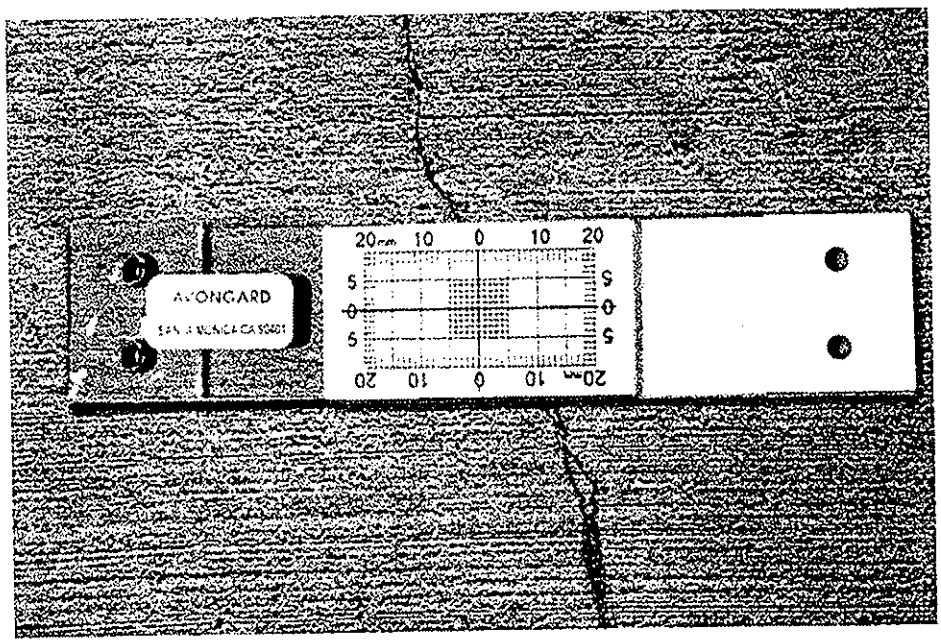

Figure 2. With advanced notice of adjacent construction activity, a crack monitor can be used to determine whether existing cracks in the historic building are stable or still experiencing movement. Compared with measurements taken during the monitoring phase, such information can help determine if subsequent movement resulted from work on the neighboring site. Photo: Avongard Products U.S.A., Ltd.

Vibration

Demolition and new foundation work are common sources of vibrations that can affect adjacent structures. The tools and methods used in demolition, such as impact hammers, wrecking balls, pavement breakers and implosion blasting, produce vibrations that may be transmitted to the historic structure. Similarly, techniques used to prepare new foundations (pile driving and blasting) create potentially dangerous vibrations. Vibrations may also be caused by increased truck traffic accompanying new construction or demolition work. In all cases, the force of the vibrations reaching the adjacent historic structure depends upon the activity generating the vibrations, the distance between the source and the existing structure, and the type of soil or pavement found between the two.

Historic structures may be particularly vulnerable to the effects of vibrations generated at an adjacent site. Deferred maintenance and past alterations may have produced structural weak points that are susceptible to damage. Historic finishes, such as plaster walls and ceilings, lack the flexibility to accommodate abnormal movement, while shallow foundations (common in historic buildings) may lack the rigidity to resist vibration induced movement.

Mitigating the effects of vibrations should begin during the consultation process when acceptable levels can be set and alternative processes explored. Hand demolition is an appropriate substitute when conventional demolition activities may cause excessive vibrations. If pile driving is likely to damage adjacent structures, the contractor may be able to employ non-displacement piles that are inserted in bored holes rather than driven. Lower vibration levels can also be achieved by "jacking-in" or pressing the piles into the ground. Locating delivery entry and exit points farther from the historic site may reduce vibrations caused by increased vehicular traffic. Once construction is under way, continual crack and vibration monitoring provides an effective warning system, indicating that established safe thresholds have been crossed.

Movement

Excavation and foundation work can also cause ground displacement and movement of an adjacent historic building. New construction almost invariably calls for digging a foundation that is much deeper than the foundations of neighboring historic buildings. This is especially true for projects that include underground parking facilities. A historic structure, with a shallow masonry or stone foundation and wall footings, may experience corresponding displacement that can result in major structural damage.

Efforts to control movement should begin during the consultation phase. Whether the developer's engineer selects underpinning or strengthened excavation walls with tie backs as the means to resist movement of the adjacent structure, the historic building team should retain its own engineer to review the plans *(see figure 3)*. The consulting engineer should ensure that the selected approach addresses the unique characteristics and vulnerabilities of the historic structure and that even incidental movement is restricted.

Water

A well functioning water drainage system is essential to the protection of any historic structure. This system can easily be rendered ineffective by neighboring construction or demolition work. Debris originating at the construction site often finds its way to the gutters, downspouts and drains of an adjacent building. Drainage mechanisms may also become inoperable when excavation workers inadvertently seal off or collapse old pipes running from neighboring buildings. If blocked pipes cannot remove water from both above and below the surface of an historic site, excessive moisture levels or flooding may result.

Regular visual inspections (part of the monitoring program described later) are one of the best means of thwarting increased moisture levels. The inspection procedure should include checking gutters, valleys and exposed drains for any obstructions. Also, indications of dampness or water damage in the basement and where gutters and downspouts meet other building surfaces should be noted.

Construction site runoff from cement mixing and cleaning and dust suppression activities should not flow toward the historic property. Although placing screens and wire cages over exposed areas of the drainage system may provide some protection from obstructions, such installations need to be inspected just as frequently. Low-pressure water washes can occasionally be used to flush the system of dirt and debris. To reduce the possibility that drainpipes will be blocked at the adjacent construction site, all concealed pipes should be traced from their origins at the historic structure and the

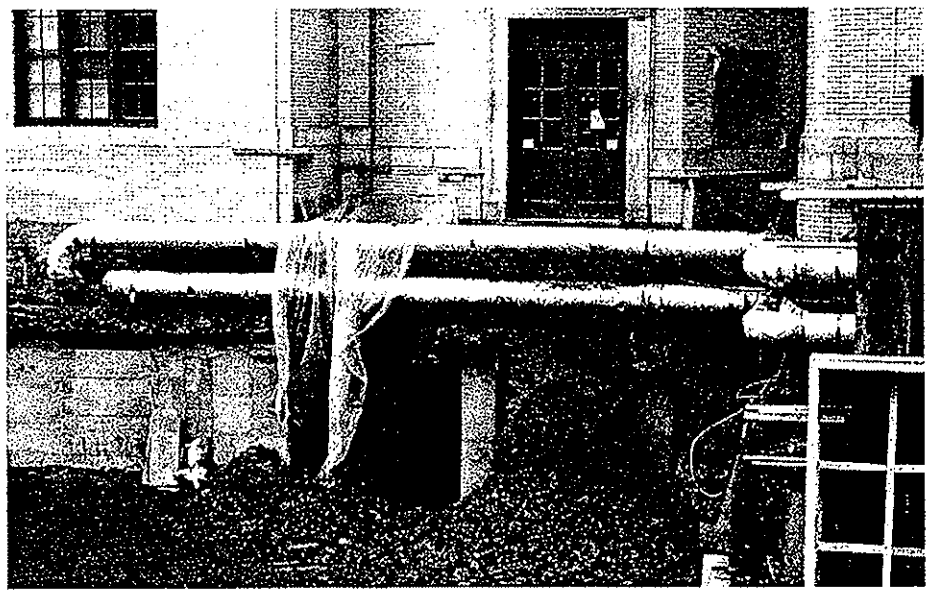

Figure 3. Concrete pier underpinning to an existing building may be necessary when adjacent construction occurs. In this example, pits are hand dug beneath the foundation of the historic building to provide space for wood forms. After concrete is poured into the forms, the space between the top of the pier and the bottom of the original foundation is packed with a quicksetting grout. The historic building owner should retain an independent engineer to ensure that the underpinning plan adequately protects the historic structure. Photo: Professor Arpad Horvath, Department of Civil and Environmental Engineering, University of California, Berkeley.

information passed on to the appropriate contractors. Final landscaping and grading patterns on adjacent construction sites should be examined to ensure that rainwater is not routed towards the historic building.

In some cases, the lack of water beneath an historic structure can lead to damage. Buildings located in areas with a high water table were often constructed upon timber piles. When groundwater or storm water is removed from a neighboring site during foundation excavations (a process known as "dewatering"), the groundwater level beneath the historic site may also drop. Previously submerged timber piles that are exposed to air can quickly begin to undergo dryrot. If there is reason to suspect that the structure was built on such a foundation, the property manager should work with the neighboring construction team to maintain the existing water table. This can be done using watertight excavation support systems such as slurry walls which ensure that most of the water pumped out of the construction site does not come from adjacent properties. Dewatering of soft clay ground may also result in settlement of a neighboring building, as ground water pressure is reduced and the soil consolidates.

Fire and Security Concerns

The heightened possibility of fire accompanies many demolition and new construction activities. Temporary heating devices, torches, sparks, molten metal and undersized electrical utility panels are some of the most common sources of fire at construction sites. Additionally, the improper storage of fuels, cloth rags and brushes also presents opportunities for fire to ignite and spread. The *Tech Note*, "Specifying Temporary Protection of Historic Interiors during Construction and Repair," provides detailed information on reducing the likelihood of fire in situations involving work near historic structures.

The security of a historic building can be threatened when adjacent construction provides opportunities for illegal entry. Newly constructed floor levels at the building site may make the neighboring historic structure's ledges, windows and rooftops accessible to trespassers. Window openings on the historic building should be fastened and all doors from the roof to the interior should be locked. Where a historic structure is protected by an intruder alarm system, that system should be upgraded to protect rooms that are rendered accessible from the outside. In cases where the historic structure does not directly abut new construction or demolition activity, attention should still be paid to the possibility that incidents of vandalism and theft will carry over to the historic site.

Physical Impact

Construction or demolition can cause direct physical damage to neighboring historic features and materials. Cranes, hoists and workers on upper floors of a construction site can drop building supplies and tools onto an adjacent historic structure. Misdirected debris chutes and backing vehicles may also leave their mark.

Generally, to counter these occurrences, protective barriers are placed over any area of the historic structure deemed at risk. If the new construction will rise above the historic building, plywood sheets should be placed over the roof to distribute the force of dropped materials *(see figure 4)*. Plywood covers should also be placed over decorative roof embellishments such as finials and balustrades. Alternately, horizontal netting can be rigged to shield vulnerable rooftop features.

Facades that are directly exposed to adjacent construction sites should receive close attention. To avoid damage, windows should be covered with plywood. Layers of cushioning materials can be placed between the plywood covering and particularly fragile windows, such as stained glass. If entire wall surfaces are vulnerable, scaffolding should be erected against the facade and debris netting placed on the outside of the scaffolding. Plastic sheeting can provide added protection in areas where acidic cleaning solutions may splash onto historic facades, windows and other surfaces.

The best means of protecting a historic structure from physical impact, however, is often to have adequate horizontal and vertical netting and barriers in place at the construction site. When adjacent buildings are adequately considered in the construction site netting and scaffolding plans, protective measures at the historic site can be less intrusive, and the likelihood of damage reduced even further.

Additional Dangers

Other byproducts of new construction and demolition, such as dirt and dust, can also pose threats to an adjacent historic structure. Dust suppression measures including the installation of fabric enclosure systems should first be employed at the building site *(see figure 5)*. Despite these efforts, historic building owners will undoubtedly have to deal with raised levels of dust infiltration. Accordingly, vulnerable interi-

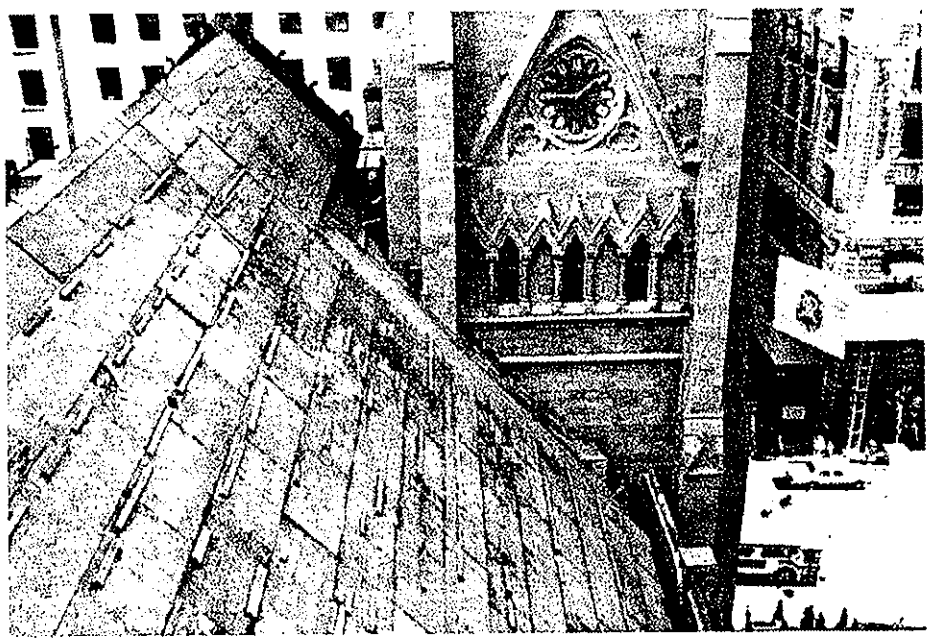

Figure 4. Dropped equipment, tools, and materials all present risks when new construction rises above neighboring historic structures. In this case, the historic slate roof was completely covered with sheets of exterior grade plywood. Photo: National Park Service files.

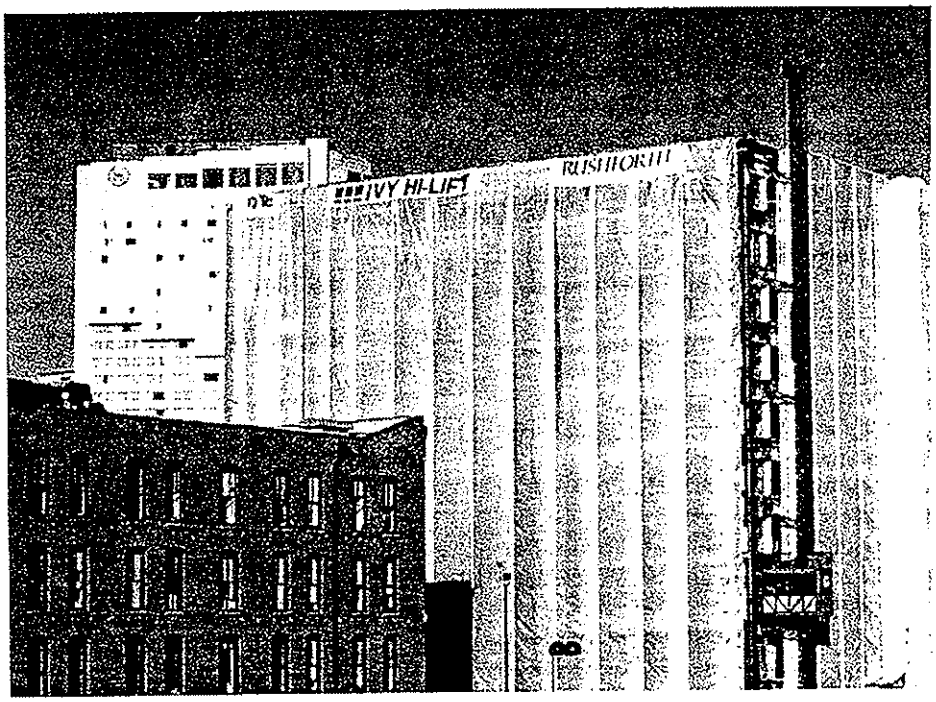

Figure 5. The historic building on the left is partially protected from debris and dust generated by the renovation of the structure to the right. Such temporary enclosure systems consist of a polyethylene or other fabric shell stretched between an aluminum frame. Photo: Walton Technology, Inc.

or objects and artifacts should be covered or temporarily moved to another location. Windows can be taped shut or temporarily sealed with clear polyethylene sheets. Additional mats or carpets near entrances can help reduce the amount of dirt tracked inside. An accelerated maintenance program that includes thorough and frequent cleaning and HVAC filter replacement, is an effective means of addressing the degraded environment surrounding a construction site. To lessen the chance of airborne asbestos infiltration, the exhaust from sealed work areas must be properly filtered and vented away from historic buildings.

The owner of a historic property should anticipate the increased rodent and pest presence that accompanies major demolition activity. Newly opened holes in old foundations are easy escape routes that should be promptly sealed. The construction or demolition site rodent control plan should include provisions for protecting adjacent historic resources. Concurrently, the historic property owner should consider securing a contract with an independent extermination company. Plans should include both preventive measures to reduce conditions favorable to infestation as well as a system of eradication such as rodenticide and traps.

Monitoring

A monitoring program should be established during the consultation and documentation phases and continued until adjacent work is finished. It is undertaken to detect, gauge, record and interpret structural movement, the effects of vibration and other changes to the historic building that result from neighboring construction or demolition work. Data collected during the monitoring program can serve as a baseline for any subsequent movement or changes to site drainage patterns that arise within the first years after construction is completed. Ultimately, monitoring shows the degree to which steps taken to protect an historic structure from adjacent construction are sufficient and successful.

Because of liability concerns, those responsible for a new development will often arrange to monitor an adjacent structure. As with a documentation program, the historic property owner may want to hire an independent engineer to review both the monitoring process and the measurements that result.

The extent of the monitoring program and the tools used will depend upon the scope of the adjacent activity. A basic plan to address concerns over vibration levels may include a single seismograph placed on the structure's basement floor. More comprehensive measurements can be obtained by locating sensors at several points throughout the structure and the ground immediately adjacent to the historic building foundation *(see figure 6).*

Whether acceptable vibration levels are mandated by law or left to the discretion of a project engineer, thresholds should take into account surrounding soils, the makeup and condition of the adjacent foundation and the particular vulnerabilities of the historic resource. Construction projects that involve major excavation work next to historic structures should include a program of test blasting before work begins. Testing various charges, delays and blast design configurations will aid in developing a controlled program that limits blast induced damage to a neighboring property.

Structural movement as described in the preceding section is detected and recorded using a number of different tools. Electronic monitors that feed precise movement measurements to laptop computers can be placed across existing cracks *(see figure 7).* When budgets are tight or a large number of cracks are involved, inexpensive telltales made from two sheets of overlaid plastic with a grid can be used to track changes.

Optical survey instruments provide another means of detecting vertical and lateral movement within a historic building. Control points are established and marked by targets or reflectors on the historic structure facade and interior walls before adjacent construction begins. The location of each of these markers is precisely measured at regular intervals. Engineers then use the resulting information to determine whether the markers have shifted from their original positions and, if so, the rate and direction of movement.

A program of visual inspections undertaken by a qualified conservator or engineer is an important adjunct to technical monitoring procedures. Inspectors should look for newly opened cracks, other signs of settlement and movement, and evidence of increased dampness or water infiltration. Additionally, visual inspections should ensure that temporary protective coverings are secure, that dust and dirt are not accumulating in the historic building, and that fire and hazardous material protection provisions are being upheld. A checklist can be drawn up during the consulting and documentation phases for use during

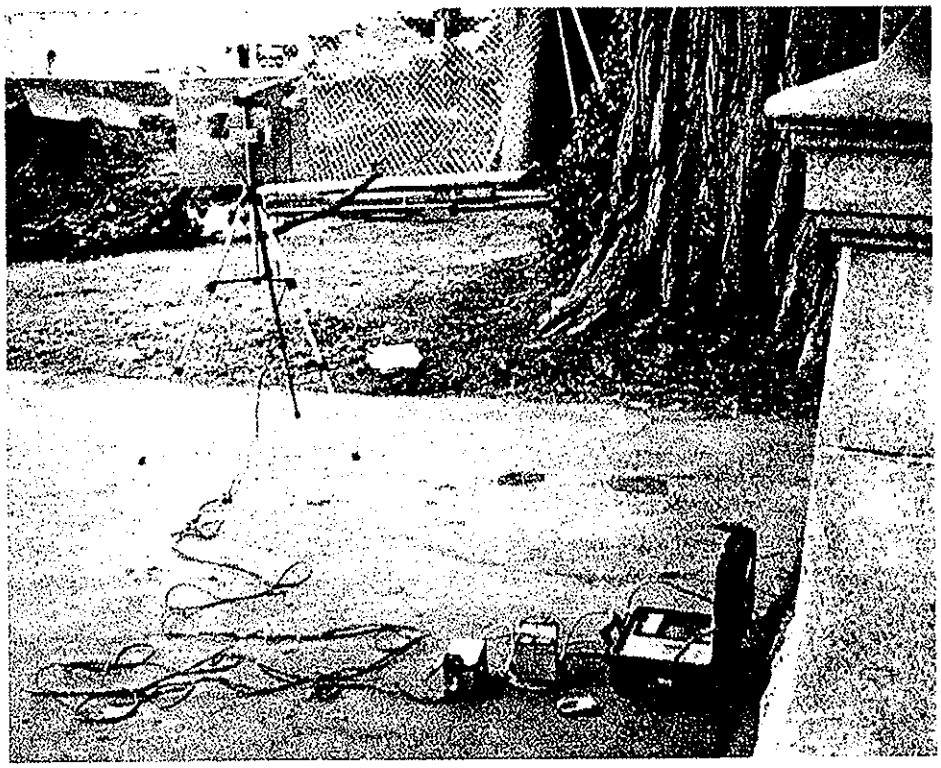

Figure 6. A seismograph records vibrations transmitted at the ground level of an historic building. The instrument is wired to a light and siren designed to warn the excavation crew that vibration levels are approaching preset limits. Additional sensors are often installed in the basement and on sensitive features such as stained glass windows. Photo: Wilson, Ihrig & Associates, Inc.

each visual inspection. Such a systematic written record may also prove useful if disputes arise over the timing of and responsibility for damage.

Conclusion

Protecting a historic building from adjacent construction or demolition activity requires thoughtful planning and cooperation between the developer and the historic property owner. Thorough pre-construction documentation of the historic structure ensures a common understanding of present conditions and suggests appropriate damage prevention measures that can be taken at both the historic site and the construction site. A routine program of visual inspection and vibration and movement monitoring helps insure early detection of the effects neighboring construction work is having on the historic building. Early consideration of these issues, before damage takes place or worsens, can allow for the adoption of safeguards that protect the developer's schedule and budget and the physical integrity of the historic structure.

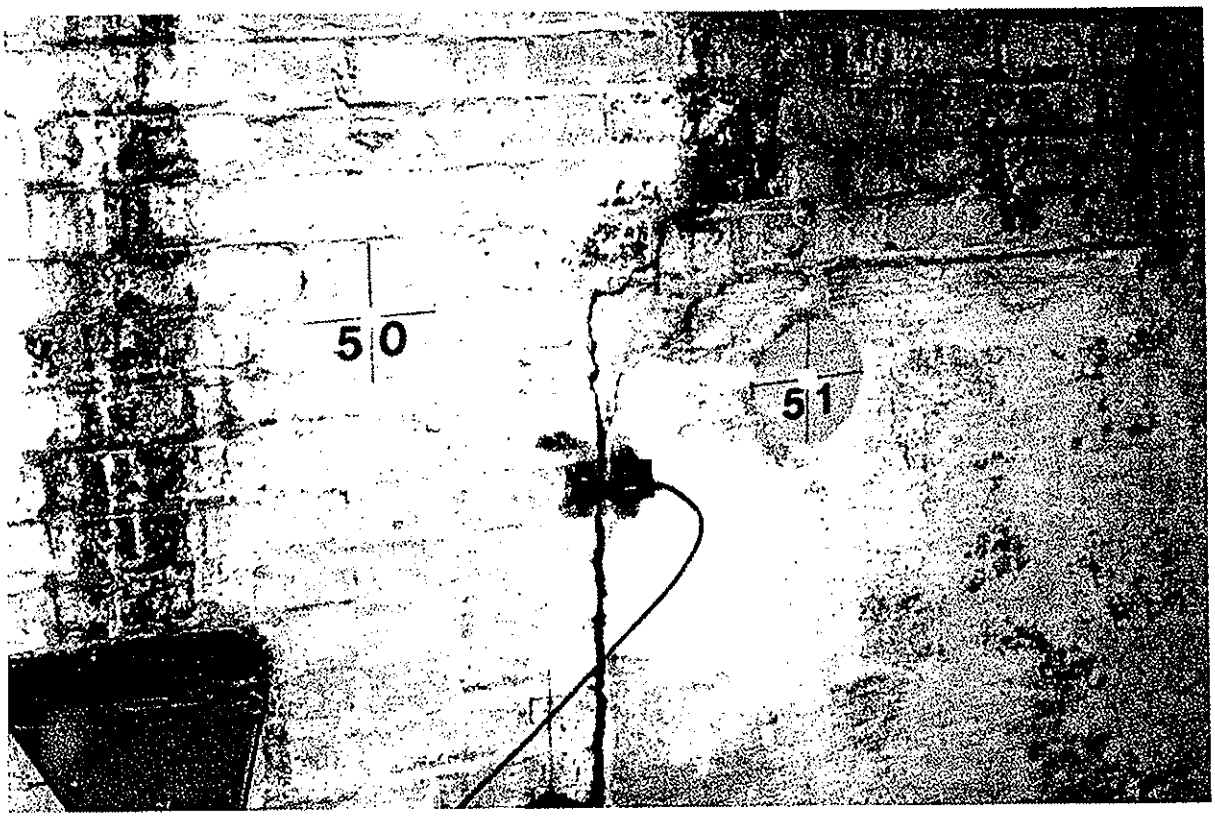

Figure 7. Electronic crack monitor and survey targets are shown installed on an existing wall. The crack monitor feeds movement data to a laptop computer. The targets are aligned and measured with optical survey equipment to determine the degree and direction of movement. Photo: McMullan and Associates, Inc.

Checklist for Historic Property Owner and Historic Site

- ☐ Consult with developer, and other parties to determine extent of work and identify necessary protective measures
- ☐ Conduct survey of existing conditions, including 35 mm photographs, crack inventory and description of other damage
- ☐ Include historic building in construction site fire plan
- ☐ Secure windows and rooftop doors that are made accessible by new construction
- ☐ Remove particularly fragile interior objects and furnishings from site
- ☐ Install temporary supports beneath fragile features that are not moved
- ☐ Place plywood coverings on openings that face construction area
- ☐ If adjacent construction rises above historic site, protect roof with plywood covering, encase rooftop embellishments
- ☐ If construction is directly adjacent, cover historic facade to protect against mortar and acidic cleaning solution
- ☐ Install temporary floor coverings at entrance and seal windows facing construction site to limit dust infiltration
- ☐ Remove dust from interior surfaces on accelerated schedule
- ☐ Clean HVAC system & filters on accelerated schedule
- ☐ Clear obstructions from gutters and drainage system regularly
- ☐ Establish monitoring program, including:
  1) Seismographs to ensure that effects of blasting, pile driving and other work are at acceptable levels
  2) Crack monitors and optical survey methods to detect movement
  3) Schedule of regular visual inspection

Checklist for Development Team and Construction Site

- ☐ Consult with historic property owner and other relevant parties to identify necessary protective measures
- ☐ Review and sign off on pre-construction condition survey of adjacent property
- ☐ Arrange delivery locations and times to limit disruption and possible damage to neighboring historic structure
- ☐ Explore excavation and demolition methods that produce low vibration levels
- ☐ Limit movement of adjacent building with sufficient underpinning or reinforced excavation walls
- ☐ Reduce changes to adjacent ground water level during dewatering
- ☐ Ensure water runoff is not directed toward historic structure
- ☐ Install appropriate debris nets to prevent dropped materials from impacting historic building
- ☐ Direct debris chutes away from historic structure
- ☐ Install fabric enclosure system to reduce spread of construction dust
- ☐ Include adjacent historic building fire plan and ensure fuels, rags and brushes are stored appropriately and not directly adjacent to historic site
- ☐ If asbestos or lead remediation is involved, ensure exhaust from sealed building is filtered and vented away from historic site and that lead chips are gathered and removed
- ☐ Include adjacent historic structure in rodent control program and seal openings in demolished foundation
- ☐ Participate in monitoring program at historic site to ensure that vibration levels or indications of movement are within established thresholds

This PRESERVATION TECH NOTE was prepared by the National Park Service. Charles E. Fisher, Heritage Preservation Services, serves as the Technical Editor. Special thanks go to Deborah Slaton and Michael J. Scheffler, P.E., of Wiss, Janney, Elstner Associates, Inc., Sharon Park, Kay Weeks and Michael Auer of the National Park Service's Heritage Preservation Services, and Marie Ennis of Einhorn Yaffee Prescott for their review and comments. Thanks also go to Denis McMullan, McMullan and Associates; Richard Ortega, PE, Ortega Consulting; Dorothy Richter, Hager-Richter Geoscience, Inc.; George Siekkinen and Gregory Mixon, National Trust for Historic Preservation; Suzanne Pentz, Keast & Hood Co.; Mark Richards, Moretrench American Corporation; Dr. Edward J. Cording, Department of Civil and Environmental Engineering, University of Illinois; Mark Gaudschaal, Schnabel Foundation Co.; William Stivale; Robert M. Powers, Powers and Associates; Martin P. Azola, Azola and Associates; and Margaret Gardiner and Mary Knapp at Merchant's House Museum, for their assistance. Tim Buehner, National Park Service, and Camille Martone provided initial research for this publication.

PRESERVATION TECH NOTES are designed to provide practical information on traditional practices and innovative techniques for successfully maintaining and preserving cultural resources. All techniques and practices described herein conform to established National Park Service policies, procedures and standards. This Tech Note was prepared pursuant to the National Historic Preservation Act which direct the Secretary of the Interior to develop and make available to government agencies and individuals information concerning professional methods and techniques for the preservation of historic properties.

Comments on the usefulness of this information are welcomed and should be addressed to PRESERVATION TECH NOTES, Technical Preservation Services NC200, National Center for Cultural Resources, National Park Service, 1849 C Street, NW, Washington, DC 20240.

ISSN: 0741-9023 PTN 42 July 2001